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PROGRESS REPORT
 FOR
 MONTH OF MARCH 1960

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BROADBAND ANTENNA, FILTER AND DETECTOR SYSTEMS

Purpose: To develop a system of antennas, filters and detectors for the 50 mc to 40,000 mc frequency range.

Personnel: Electrical Engineers:
 Mechanical Engineer:
 Mathematicians:

25X1

Status: The compact 50 mc to 500 mc LP antenna has been constructed by printing the antenna elements on aluminum coated mylar. A tentative mechanical design for mounting the feed cable and auxiliary equipment is underway. It is anticipated that this model will have to be printed on a material with a thicker lamination of aluminum. One skin depth at 50 mc is approximately 0.36 milli inches. The present model has a metal thickness of approximately 1.5 micro inches and the power loss due to the increased current density in the thin conductor becomes prohibitive. For a conductor thickness of one depth of penetration the power loss over a conductor of infinite thickness will be about 8%. Since flexibility requirements preclude use of a heavier material, it is believed that the sacrifice in resistive losses on the surface of the antenna of one skin depth thickness will be justified. Bandpass filters for the frequency range covered by this antenna have been ordered and should be delivered the first week in May.

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The development of the 500 mc to 10,000 mc antenna has continued. The antenna to cover the 500 mc to 1000 mc frequency range is a truncated version of the 500 mc to 10,000 mc model. A design based on necessary lengths to prevent pattern deterioration was completed, but the impedance dropped to one half the desired value. An investigation was conducted to determine the variation of impedance with degree of truncation. A compromise between impedance and length was decided upon. Final construction of the 1000 mc to 10,000 mc antenna is underway.

Work has continued on the 10,000 mc to 40,000 mc horn antenna, detector and dielectric waveguide inserts. Preliminary testing indicates that the desired filtering characteristics may be obtained. Radiation patterns have been obtained at several frequencies between 10,000 mc and 30,000 mc.

The filter synthesis investigation has continued. A low pass strip transmission line filter has been fabricated and tested. It has a cutoff frequency of 2000 mc and a strip band attenuation in excess of 60 db. The pass band insertion loss has a maximum of 2.5 db near the cutoff frequency. The VSWR is less than 2 to 1 in the pass band. A high pass strip line filter has also been fabricated but testing is incomplete. A 5000 mc to 10,000 mc bandpass filter has been received from Microphase Corp. Insertion loss in the stop band ($\pm 15\%$ from the cutoff frequency) is 60 db or greater and in the pass band is less than 2 db. VSWR in the pass is less than 2.5 to 1.

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Sensitivity evaluation of the 50 mc to 10,000 mc crystal detector assemblies has continued. Evaluation of ten stock crystals indicates sensitivities of -50 ± 3 dbm from 1000 mc to 10,000 mc.

Future Plans: Work in all phases will continue. Range testing of the 50 mc to 500 mc antenna will be accomplished early in the next period. Completion of the 500 mc to 10,000 mc antennas is anticipated during the next period. The crystal detector evaluation will continue.

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